

**SUITABILITY OF *BREVICORYNE BRASSICAE*
AND *MYZUS PERSICAE* (HOMOPTERA:
APHIDIDAE) AS HOSTS OF *DIAERETIELLA*
RAPAE (HYMENOPTERA: APHIDIIDAE)¹**

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ABSTRACT: The green peach aphid, *Myzus persicae*, and the cabbage aphid, *Brevicoryne brassicae*, were suitable hosts for the parasite *Diaeretiella rapae*. No significant differences in developmental or performance criteria were exhibited by the two aphid hosts. *D. rapae* oviposited more frequently and produced a significantly higher percentage of female progeny when reared on the cabbage aphid.

Diaeretiella rapae (McIntosh) was first described by Curtis (1885), and was recorded as the only primary parasite of the cabbage aphid, *Brevicoryne brassicae* (L.) (George 1957, Hafex 1961, Chua 1977). *D. rapae* has been considered both important (Strickland 1916, Barnes 1931) and insignificant (Prethbridge and Mellor 1936, Todd 1959) in the control of cabbage aphid infestations.

Habitat selection by the Aphidiidae in general and *D. rapae* in particular was speculative until recent works by Read et. al. (1970) and Akinlosotu (1980). They concluded that *D. rapae* responded to olfactory cues in selecting habitat, and then relied on random search to discover hosts within the habitat. The mustard oil, allyl isothiocyanate, is the stimulus by which *D. rapae* orients to habitat, and it may play a role in stimulating the parasite to oviposit (Read et. al. 1970). *D. rapae* is reported to parasitize eight different aphid species, but is seldom found parasitizing aphids not on crucifers. Host association with habitat may be of more importance in determining host range than taxonomic affinity (Townes 1960). Simpson et. al. (1975) used the green peach aphid, *Myzus persicae* (Sulzer), to rear the parasite, but in earlier tests, cabbage aphids were considered the preferred hosts (Hafez 1961). For most parasites, host preference may affect progeny size, fecundity, vigor and sex ratio (Salt 1935).

This study was undertaken to assess host preference and suitability of green peach aphids and cabbage aphids as hosts for *D. rapae*. Longevity and fertility of the female parasite and sex ratio of the progeny were used to determine suitability.

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MATERIALS AND METHODS

Laboratory colonies of *M. persicae* and *B. brassicae* were maintained at $19 \pm 5^\circ \text{C}$ and $70\% \pm 10\% \text{RH}$ with a photoperiod of 15L:9D at the University of Tennessee, Knoxville. Parasites were obtained from *B. brassicae*, and were allowed to mate 0-24 h after emergence. Female parasites were placed in individual cages after mating, and were daily presented a minimum of 50 second and third instar aphids reared on broccoli leaves. Infested leaves were removed daily and held for mummy formation. Mummies were removed, counted and placed in 2 ml vials until emergence of adult parasites. The procedure was replicated 10 times with *M. persicae* alone, *B. brassicae* alone, and both species simultaneously as potential hosts. Developmental time, emergence success, and sex ratio of progeny were recorded. No effort was made to determine if mummies from which no parasites emerged contained dead or diapausing parasites.

Host preference was assessed by comparing the mean number of each species parasitized when both were available. Sex ratios from the three host groups were compared as was sex ratio of the progeny from each aphid species when both were available. Sex ratio in this study was not the primary sex ratio, but that of progeny surviving to adulthood and successfully emerging. All mean comparisons were made using the t-test ($p=0.05$).

RESULTS

Mean fertilities of *D. rapae* ovipositing in the three groups accounted for over 50% of all progeny produced by the fourth day after onset of oviposition. A rapid decline in the rate of oviposition followed, and no aphids were successfully parasitized after the seventh day (Fig. 1a). Parasite fertility ranged from 27 to 135 aphids parasitized, but mean fertilities for the three host groups were not significantly different. The rate at which each of the two aphid species was parasitized in the mixed colony was significantly different from other host groups and from each other (Fig. 1b). The rate of parasitization of the cabbage aphid was ca. four times greater than that of the green peach aphid. The mean percentage of females produced from the three host groups increased from 55% on the first day to 85% on the fourth day, but then declined steadily until the sixth day (Fig. 2a). Although no significant differences were noted for the mean number of females produced from each of the three host groups, the percentage of females reared from green peach aphids in the mixed colony was significantly lower than the percentage of females reared from cabbage aphids of that group or from green peach aphids and cabbage aphids presented alone (Fig. 2b). No significant differences were noted for longevity, developmental time, or percent successful emergence of *D. rapae* in three host groups.

DISCUSSION

Once a host has been selected by a female parasite, development of the next generation depends on the suitability of the selected host (Vinson 1976). Presentation of the two aphid species in a homogenous environment and at

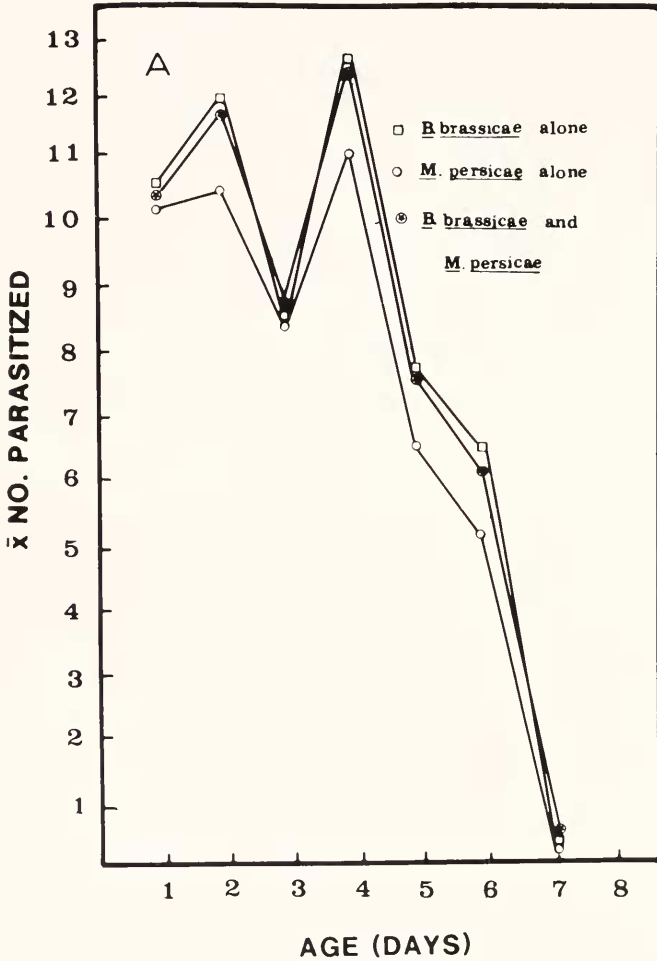
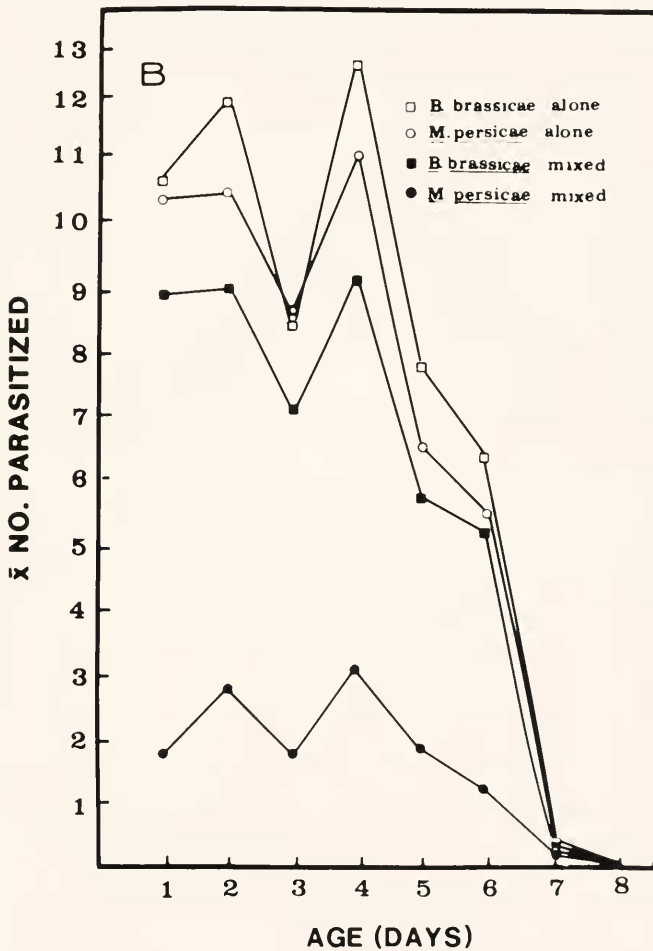


Fig. 1. Mean number of *Brevicoryne brassicae* and *M. persicae* parasitized daily by *Diaeretiella rapae*: (A) for three host groups, (·) for each species.

equal densities eliminated two of the four steps necessary for successful parasitization (Salt 1935, Flanders 1953, Douth 1959) leaving only host acceptance and suitability as determining factors. Lack of significant differences in mean fertility, developmental time, sex ratio or percent successful emergence for *D. rapae* on either of the two aphid species presented alone suggests their equal suitability as hosts.

Hafez (1961) reported that *D. rapae* averaged 10.3 eggs per day per female on cabbage aphid hosts when superparasitism was considered. The



parasitism rate of 8.3 aphids per female per day in this study is similar with Hafez's because superparasitism was not taken into account.

Longevity for females in an insectary at 20 °C varied from 4.8 days (Akinlosotu 1980) to 15 days (Hafez 1961). Nutritional stability of a host may have an effect on developmental time of the parasite and successful emergence (Vinson and Iwantsch 1980) and different hosts may have different effects. Mean developmental time for *D. rapae* was 13 days in this study which fell between the reported minimum of 11 days on the green peach

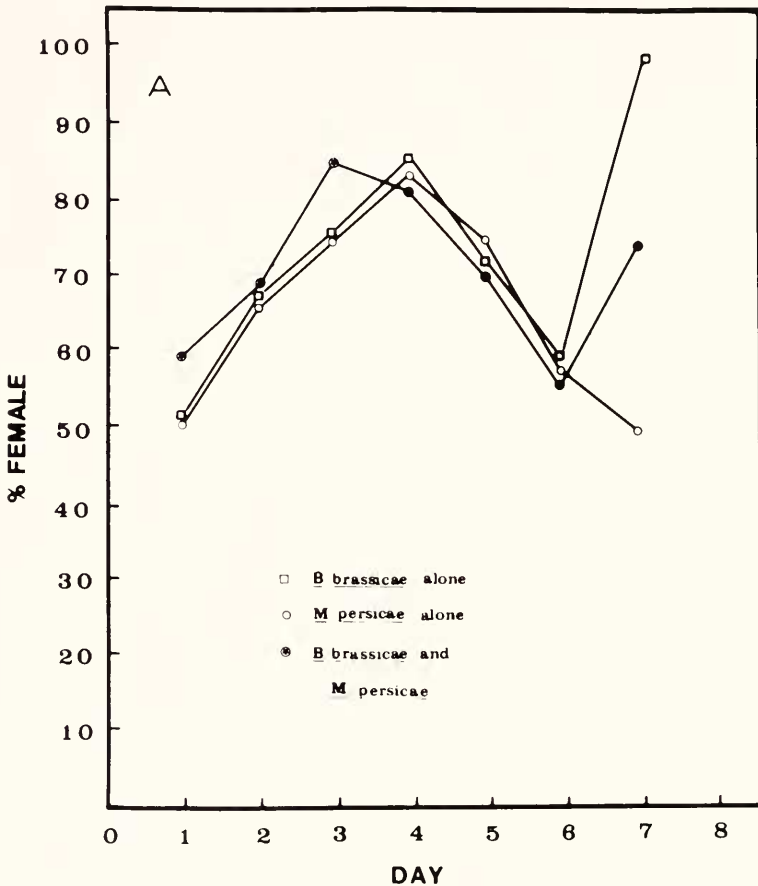
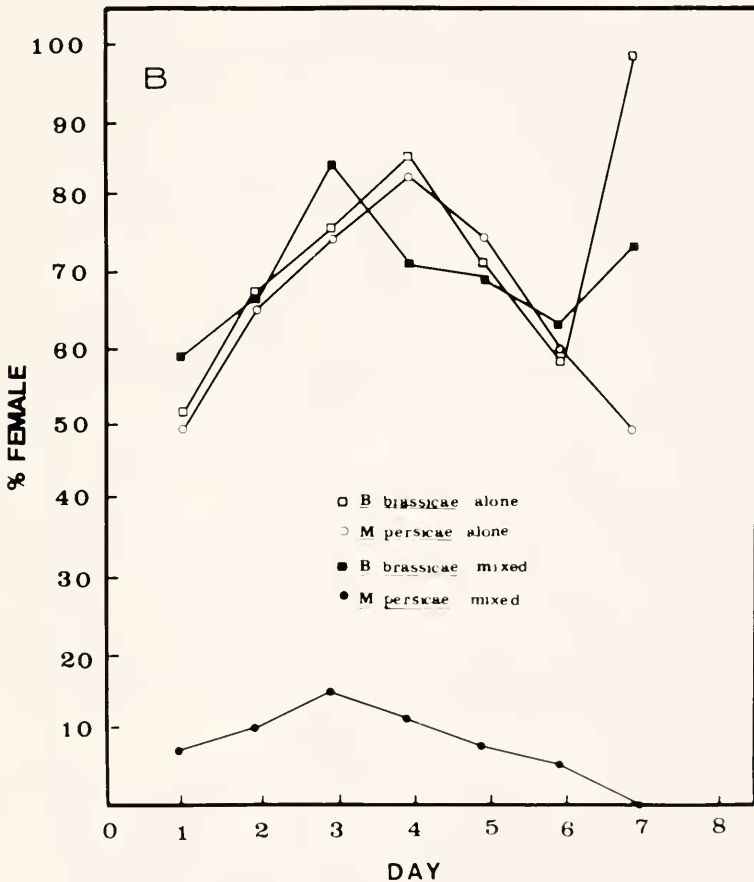


Fig. 2. Percent female progeny of *Diaeretiella rapae* produced from: (A) each of three host groups, (B) each species.

aphid (Simpson et al. 1975) and the maximum of 15 days on the cabbage aphid (Akinlosotu 1977). The variation in percent successful emergence was 0.8% which indicated no substantial difference in the suitability of either host. The sex ratio of 66% females on the green peach aphid to 73.5% on the cabbage aphid in our study closely approximates the range of 60% (Simpson et al. 1975) to 73.4% (Hafez 1961).

In the mixed colony of green peach aphids and cabbage aphids, there was a significant difference in the rate of parasitization of the two species. Host discrimination had an impact on sex ratio of the progeny. The parasitization rate of the green peach aphid dropped 77.7% when it was the only available



host and resulted in an 87% decline in female progeny. Conversely, the rate of parasitization of the cabbage aphid dropped 21.2% and the female progeny dropped 3.6%.

Although each aphid species was equally suitable as host for *D. rapae*, the parasite oviposited more frequently in cabbage aphids and more female progeny were produced with this host. The parasite apparently prefers the cabbage aphid as a host which corresponds with earlier findings by Heong (1981).

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